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EXAMINER	
DOTY, HEATHER ANNE	
ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 05/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/819,688	NATORI, EIJI	
	Examiner	Art Unit	
	Heather A. Doty	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11,15-17,34 and 35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *35* is/are allowed.

6)☒ Claim(s) *1-11,15-17 and 34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11/12/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 4-8, 11, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koketsu et al. (JP 402179880) in view of Hintermaier et al. (U.S. 6,120,846) and Adachi et al. (JP 04035033).

Regarding claims 1 and 5, Koketsu et al. teaches forming ceramics on a substrate (10) by mixing a gasified fine particle of a raw material (1) with an active species (oxygen 9) having high kinetic energy; feeding the mixed fine particle (1) and active species (oxygen 9) to the substrate (10) so that the fine particles of the raw material are deposited on the substrate while being provided with kinetic energy from the active species; and providing energy to the fine particles of raw material by the active species, wherein the ceramic film is formed by misted CVD or LSMCD (2) (See Abstract and Constitution.) The Examiner notes that the microwave source (6) provides energy to the gases 3, 5, and 9, thereby making them active. Additionally, gas 9 also imparts its energy to the fine particle raw material gas/mist.

Koketsu et al. fails to explicitly teach forming a film-forming region having affinity to ceramics to be formed, and a non-film-forming region having no affinity to the ceramics to be formed, thereby self-alignably forming a ceramic film on the film-forming

region, wherein the film-forming region is the partial portion of the substrate; or increasing the migration energy of atoms in the ceramic film for crystallization of the ceramic.

However, Hintermaier et al., in columns 3-4, lines 30-44 and Fig. 1, teaches a ferroelectric dielectric material that is selectively deposited on a bottom electrode (18) (having affinity to ceramics) and not deposited on the base member (11) (not having affinity to ceramics), wherein depositing the base member on a partial portion of the substrate and providing it with a high density of absorption sites forms the film-forming region on a partial portion of the substrate.

It would have been obvious to one of ordinary skill in the art to modify Koketsu et al. by incorporating a ferroelectric dielectric material that is selectively deposited on a film-forming region (bottom electrode provided with a high density of absorption sites) and not deposited on the non-film-forming region (base member), as taught by Hintermaier et al., to allow for the fabrication, in one oxide deposition step, of ferroelectric and nonferroelectric capacitors.

Furthermore, Adachi et al., in the Abstract and Constitution, teaches wherein a ferroelectric film with good crystallinity and free of pin-hole defects is formed by reaction of a vapor source (1) (PbLaZrTi alloy) with an oxygen plasma (i.e. - active oxygen species). The Examiner notes the temperature used by Adachi (i.e. - 500 °C) is within the range discussed by Applicant in their specification at pages 5-6. Finally, the Examiner notes that when a plasma is struck within a closed environment, all other conditions being held constant, the energy introduced by the microwaves will inherently

increase the migrational energy of atoms because the temperature will rise with the input of energy (i .e. - Kinetic Energy = (3/2)RT, wherein R is the universal gas constant and T is the temperature).

It would have been obvious to one of ordinary skill in the art to modify Koketsu et al. and Hintermeier et al. by incorporating crystallization of a ceramic film by introducing a plasma to increase migrational energy, as taught by Adachi et al., to enhance the electrical properties of the ferroelectric film by increasing the crystallinity.

Regarding claim 4, incorporating all arguments of claim 1 and noting that Koketsu et al. teaches electrically charging the fine particles (1). (See Abstract and Constitution.) The Examiner notes that the fine particles are charged via friction from flowing through the process pipes (noting Applicant's specification page 6 lines 14-18).

Regarding claim 6, incorporating all arguments of claim 1 and noting that Koketsu et al. teaches the active species (oxygen) is a radical or ion (9). (See Abstract and Constitution.)

Regarding claim 7, incorporating all arguments of claims 1 and 6 and noting that Koketsu et al. teaches the active species is radical or ion of the raw material species (1). (See Abstract and Constitution.) The Examiner notes that the fine particle raw material can act as the active species, as well, because it too is subjected to the microwave source.

Regarding claim 8, incorporating all arguments of claims 1 and 6 and noting that Koketsu et al. teaches the active species is an ion of oxygen (9). (See Abstract and Constitution.)

Regarding claim 11, incorporating all arguments of claim 1 and noting that Koketsu et al. teaches wherein the active species is fed to the substrate in an accelerated state (6 and 9). (See Abstract and Constitution.)

Regarding claim 15, incorporating all arguments of claim 1 and noting that Koketsu et al. teaches wherein the ceramic film is a dielectric/ceramic oxide. (See Abstract and Constitution.)

Claims 1, 4-11, and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paz de Araujo et al. (U.S. 6,110,531; hereinafter Paz et al.) in view of Hintermeier et al. (U.S. 6,120,846) and Adachi et al. (JP04035033).

Regarding claims 1 and 5, Paz et al. teaches forming ceramics on a substrate (1 17) by mixing a gasified fine particle of a raw material (113A, B, and C) with an active species (112A, B, and C) having high kinetic energy; feeding the mixed fine particle and active species to the substrate so that the fine particles of the raw material are deposited on the substrate while being provided with kinetic energy from the active species; and providing energy to the fine particles of raw material by the active species, wherein the ceramic film is formed by misted CVD or LSMCD (200) (See column 5, lines 21-30 and lines 45-56; columns 8-10, lines 39-63; columns 13-14, lines 50-10; and Figs. 3 and 4) The Examiner notes that the plasma source (137) and the UV source (135) provide energy to the gases 112A, B, and C, thereby making them active. Gases 112A, B, and C then impart their energy to the fine particle raw material gases/mist.

Paz et al. fails to explicitly teach forming a film-forming region having affinity to ceramics to be formed, and a non-film-forming region having no affinity to the ceramics

to be formed, thereby self-alignably forming a ceramic film on the film-forming region, wherein the film-forming region is the partial portion of the substrate; or increasing the migration energy of atoms in the ceramic film for crystallization of the ceramic.

However, Hintermaier et al., in columns 3-4, lines 30-44 and Fig. 1, teaches a ferroelectric dielectric material that is selectively deposited on a bottom electrode (18) (having affinity to ceramics) and not deposited on the base member (11) (not having affinity to ceramics), wherein depositing the base member on a partial portion of the substrate and providing it with a high density of absorption sites forms the film-forming region on a partial portion of the substrate.

It would have been obvious to one of ordinary skill in the art to modify Paz et al. by incorporating a ferroelectric dielectric material that is selectively deposited on a film-forming region (bottom electrode provided with a high density of absorption sites) and not deposited on the non-film-forming region (base member), as taught by Hintermaier et al., to allow for the fabrication, in one oxide deposition step, of ferroelectric and nonferroelectric capacitors.

Furthermore, Adachi et al., in the Abstract and Constitution, teaches wherein a ferroelectric film with good crystallinity and free of pin-hole defects is formed by reaction of a vapor source (1) (PbLaZrTi alloy) with an oxygen plasma (i.e. - active oxygen species). The Examiner notes the temperature used by Adachi and by Paz et al. (i.e. - 300 to 500 °C) is within the range discussed by Applicant in their specification at pages 5-6. Finally, the Examiner notes that when a plasma is struck within a closed environment, all other conditions being held constant, the energy introduced by the

plasma or UV source will inherently increase the migrational energy of atoms because the temperature will rise with the input of energy (i .e. - Kinetic Energy = (3/2)RT, wherein R is the universal gas constant and T is the temperature).

It would have been obvious to one of ordinary skill in the ad to modify Paz et al. and Hintermeier et al. by incorporating crystallization of a ceramic film by introducing a plasma to increase migrational energy, as taught by Adachi et al., to enhance the electrical properties of the ferroelectric film by increasing the crystallinity.

Regarding claim 4, incorporating all arguments of claim 1 and noting that Paz et al. teaches electrically charging the fine particles (113A, B, and C). (See column 5 lines 21-30 and lines 45-56; columns 8-10, lines 39-63; columns 13-14, lines 50-10; and Figs. 3 and 4.) The Examiner notes that the fine particles are charged via friction from flowing through the process pipes (noting Applicant's specification page 6 lines 14-18).

Regarding claim 6, incorporating all arguments of claim 1 and noting that Paz et al. teaches the active species (112A, B and C) is a radical or ion (135 and 137). (See column 5, lines 21-30 and lines 45-56; columns 8-10, lines 39-63, columns 13-14, lines 50-10 and Figs. 3 and 4.)

Regarding claim 7, incorporating all arguments of claims 1 and 6 and noting that Paz et al. teaches the active species is radical or ion of the raw material species (113A, B, or C). (See column 5, lines 21-30 and lines 45-56; columns 8-10, lines 39-63; columns 13-14, lines 50-10; and Figs. 3 and 4.) The Examiner notes that the fine particle raw material can act as the active species, as well, because it too is subjected to the plasma source and the UV source.

Regarding claim 8, incorporating all arguments of claims 1 and 6 and noting that Paz et al. teaches the active species is an ion of oxygen (112C) or nitrogen (112B). (See column 5, lines 21-30 and lines 45-56; columns 8-10, lines 39-63; columns 13-14, lines 50-10; and Figs. 3 and 4.)

Regarding claims 9 and 10, incorporating all arguments of claims 1 and 6 and noting that Paz et al. teaches the active species is an ion or radical of inert argon gas (112A). (See column 5, lines 21-30 and lines 45-56; columns 8-10, lines 39-63; columns 13-14, lines 50-10; and Figs. 3 and 4.)

Regarding claim 11, incorporating all arguments of claim 1 and noting that Paz et al. teaches the active species is fed to the substrate in an accelerated state (135 and 137). (See column 5, lines 21-30 and lines 45-56; columns 8-10, lines 39-63; columns 13-14, lines 50-10 and Figs. 3 and 4.)

Regarding claim 15, incorporating all arguments of claim 1 and noting that Paz et al. teaches wherein the ceramic film is a dielectric. (See columns 15-18, lines 60-55.)

Regarding claims 16 and 17, incorporating all arguments of claims 1 and 15 and noting that Paz et al. teaches wherein the dielectric is formed at a temperature of 450 °C or less. (See column 14, lines 26-37 and the Abstract.)

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koketsu et al. (JP 402179880) in view of Hintermeier et al. (U.S. 6,120,846) and Adachi et al. (JP 04035033, and further in view of Chivukula et al. (U.S. 6,146,905).

Regarding claims 2 and 3, incorporating all arguments of claim 1 and noting that Koketsu et al., Hintermeier et al., and Adachi et al. fail to explicitly teach a diameter of fine particle that is 0.01 micrometer or less.

However, Chivukula et al., in column 6 lines 37-40, teaches depositing a ferroelectric dielectric with a grain size of 10 nm. Further, Chivukula et al. discloses that a superior high-frequency response is noted in integrated circuits that are formed from reproducible small grain size ferroelectric layers.

It would have been obvious to one of ordinary skill in the art to modify Koketsu et al., Hintermeier et al., and Adachi et al. by incorporating a ferroelectric grain size of 10 nm, as taught by Chivukula et al., to produce a superior high-frequency response in ferroelectric films.

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koketsu et al. (JP 402179880) in view of Hindermeier et al. (U.S. 6,120,846), Adachi et al. (JP 04035033) and Sun et al. (U.S. 6,349,668).

Regarding claim 34, Koketsu et al. teaches forming ceramics on a substrate (10) by mixing a gasified fine particle of a raw material (1) with an active species (oxygen 9) having high kinetic energy; feeding the mixed fine particle (1) and active species (oxygen 9) to the substrate (10) so that the fine particles of the raw material are deposited on the substrate while being provided with kinetic energy from the active species; and providing energy to the fine particles of raw material by the active species, wherein the ceramic film is formed by misted CVD or LSMCD (2) (See Abstract and Constitution.) The Examiner notes that the microwave source (6) provides energy to the

gases 3, 5, and 9, thereby making them active. Additionally, gas 9 also imprts its energy to the fine particle raw material gas/mist.

Koketsu et al. fails to explicitly teach forming a film-forming region having affinity to ceramics to be formed, and a non-film-forming region having no affinity to the ceramics to be formed, thereby self-alignably forming a ceramic film on the film-forming region, wherein the film-forming region is the partial portion of the substrate; or increasing the migration energy of atoms in the ceramic film for crystallization of the ceramic; or biasing a substrate holder to accelerate the complex of the active species and the fine particle of the raw material species during deposition.

However, Hintermaier et al., in columns 3-4, lines 30-44 and Fig. 1, teaches a ferroelectric dielectric material that is selectively deposited on a bottom electrode (18) (having affinity to ceramics) and not deposited on the base member (11) (not having affinity to ceramics), wherein depositing the base member on a partial portion of the substrate and providing it with a high density of absorption sites forms the film-forming region on a partial portion of the substrate.

It would have been obvious to one of ordinary skill in the art to modify Koketsu et al. by incorporating a ferroelectric dielectric material that is selectively deposited on a film-forming region (bottom electrode provided with a high density of absorption sites) and not deposited on the non-film-forming region (base member), as taught by Hintermaier et al., to allow for the fabrication, in one oxide deposition step, of ferroelectric and nonferroelectric capacitors.

Furthermore, Adachi et al., in the Abstract and Constitution, teaches wherein a ferroelectric film with good crystallinity and free of pin-hole defects is formed by reaction of a vapor source (1) (PbLaZrTi alloy) with an oxygen plasma (i.e. - active oxygen species). The Examiner notes the temperature used by Adachi (i.e. - 500 °C) is within the range discussed by Applicant in their specification at pages 5-6. Finally, the Examiner notes that when a plasma is struck within a closed environment, all other input of energy (i.e. - Kinetic Energy = (3/2)RT, wherein R is the universal gas constant and T is the temperature).

It would have been obvious to one of ordinary skill in the art to modify Koketsu et al. and Hintermeier et al. by incorporating crystallization of a ceramic film by introducing a plasma to increase migrational energy, as taught by Adachi et al., to enhance the electrical properties of the ferroelectric film by increasing the crystallinity.

Finally, Sun et al. teaches a method for manufacturing ceramics on a substrate (column 3, lines 35-44), comprising mixing a liquid raw material species with an ionized gas that atomizes the liquid to turn it into an aerosol and simultaneously charges the aerosol (column 6, lines 33-49), and biasing the substrate holder to accelerate the charged aerosol of the raw material species during deposition (column 10, lines 28-58).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to modify Koketsu et al., Hintermeier et al., and Adachi et al., by biasing the substrate holder, as taught by Sun et al., to accelerate the mixed fine particle and active species taught by Koketsu et al., during the deposition. The

motivation for doing so at the time of the invention would have been to increase the deposition rate, as expressly taught by Sun et al. (column 3, line 45-column 4, line 3).

Allowable Subject Matter

Claim 35 is allowed.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art does not teach or suggest mixing a fine particle of a raw material species with an active species having high kinetic energy in a mixing chamber and then feeding the mixed fine particle and active species onto the substrate while the active species continues to provide kinetic energy to the raw material species.

Sun et al. (U.S. 6,349,668) teaches mixing ionized gas and liquid raw material species in a mixing chamber to atomize and electrically charge the raw material species prior to introducing the mixture to the deposition chamber, but does not suggest that the ionized gas continues to provide kinetic energy to the raw material species after the mixture is introduced into the deposition chamber.

As remarked by the Applicant in a communication dated 10/13/2004, Koketsu et al. (JP 02179880) discloses feeding the mist into oxygen plasma and depositing formed oxide ceramic on a substrate (abstract). The feeding of the mist into the oxygen plasma and depositing the oxide ceramic on the substrate occur in the same chamber (reaction tube 4), so no active species is mixed with the fine particles in a chamber separate from the deposition chamber where the substrate is located.

Applicant further remarked that Paz et al. (U.S. 6,110,531) teaches that the active species is not formed until in the deposition chamber 2 with the substrate, and thus fails to disclose mixing a fine particle species with an active species in a separate chamber prior to feeding the mixed fine particle and active species from the separate chamber to the chamber housing the substrate.

Adachi et al. (JP 04035033) also teaches that the raw material species is mixed with the active species (oxygen activated by microwaves) in the deposition chamber, not in a separate mixing chamber.

Response to Arguments

Applicant's arguments with respect to claims 12 and 13 have been considered but are moot in view of the new ground(s) of rejection.

Applicant traversed the former examiner's rejection of claims 12 and 13 and amended claim 1 to incorporate the subject matter of cancelled claims 12 and 13.

Applicant argued that Hintermaier (U.S. 6,120,846) teaches the presence of two substrates, a bottom electrode 18 and a base member 11, whereas the applicant's claimed invention requires a single substrate.

However, these arguments are not persuasive because Hintermeier teaches forming the bottom electrode on the base member and providing it with a large number of absorption sites, thereby forming a film-forming region on the base substrate, which supports the top electrode. Claim 1 does not specify that the film-forming region and non-film-forming regions must be formed on separate portions of a single substrate, wherein the separate portions are made of the same material. Moreover, the applicant's

specification discloses that iridium oxide may be used as the material for the film-forming sections 14, and an undisclosed fluorine compound may be used as the material for the non-film-forming section 16 (pg. 15, lines 17-19). Fig. 2B shows both of these regions, 14 and 16, made of different materials, on top of the substrate, 12.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/13/04 has been entered.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather A. Doty, whose telephone number is 571-272-8429. The examiner can normally be reached on M-F, 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

had

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PRIMARY EXAMINER